



United States
Department of
Agriculture

Forest
Service

Arizona Zone
Entomology and
Pathology

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File Code: 3400

Date: August 29, 2000

Carrie Dennett
Chiricahua National Monument
HCR #2, Box 6500
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Dear Carrie

On June 21, 2000 John Anhold, Arizona Zone Leader and I met with you to examine and diagnose the causes of Chihuahua and Apache pine mortality occurring in Chiricahua National Monument. This letter documents our visit and findings.

We examined dead and dying pines at Pickett park, Bonita Park and Rhyolite Creek. At all three sites we found evidence of bark beetle attack in affected pines, including pitch tubes, galleries, exit holes, and in some cases beetles themselves. Gallery patterns and adult characteristics are consistent with those of the southern pine beetle, *Dendroctonus frontalis*. This diagnosis was later confirmed in the lab using specimens collected in the field. Chihuahua pines were infested more often than Apache pines at all three sites. All sizes of chihuahua pines were attacked with the smallest affected trees being approximately three inches in diameter. Many of the infested pines were also infected with dwarf mistletoe, a parasite that is often observed to predispose pines to attack by beetles. Two of the sites where mortality was occurring were clearly relatively poor sites for tree growth, consisting of thin rocky soils and relatively small and widely scattered trees. Trees on such sites are frequently vulnerable to bark beetle attack during periods of drought. It appeared that the infestation has been ongoing at a slow but steady rate for several years, the number of currently infested trees per group was typically less than 5 trees. This is indicative of a fairly low level population.

After we finished visiting Chiricahua National Monument, we drove up Pinery Canyon Rd on adjacent Douglas Ranger District, Coronado NF. In this area we noted significantly more beetle activity with affected "spots" encompassing 20-30 trees in some cases. Aerial surveys just conducted by our staff indicate that there is a significant amount of mortality located in this drainage as well as in the Turkey creek drainage.

Southern pine beetle is best known as a significant cause of mortality to southern pines in the Southeastern and Gulf States. In Arizona it is reported to attack ponderosa pine and Apache pine. It has not been reported to be a significant mortality agent in Arizona. Adults are dark brown, cylindrically shaped beetles averaging 3 mm in length (figure 1). Egg galleries are mazelike and very similar in appearance to those of the western pine beetle, *Dendroctonus brevicomis* (figure 2). A notable difference is that the larval galleries and pupal chambers of southern pine beetle frequently show on the inner bark surface; those of western pine beetle do



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not. Life cycle and biology are not reported for Arizona. Presumably the life cycle is similar to that reported in other parts of the range where it produces several generations a year. In the eastern US the number of generations per year varies from 3 to 7, depending on location.

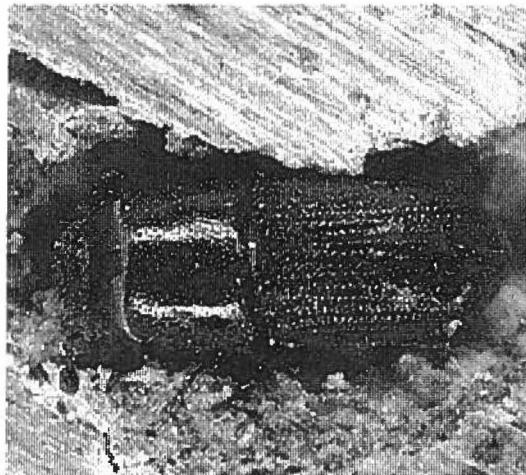


Figure 1. Southern Pine Beetle Adult



Figure 2. Southern Pine Beetle Galleries

Adult southern pine beetle attack the living host trees by boring through the bark and feeding upon the phloem tissue, where they also oviposit to start the next generation. Their ability to overtake host defenses is due to their ability to attack in large numbers over a short period of time, referred to as "mass attack". This mass attack phenomenon is mediated by airborne chemicals that the beetles produce in concert with host produced volatiles.

Many factors are reported to affect southern pine beetle populations, however all the research has been conducted in the South with southern pine ecosystems. As with other bark beetles site, stand factors can affect susceptibility of southern pines to southern pine beetle. There, high stand density characterizes many infestations. Lightning struck trees can also trigger

infestations. Both drought as well as excessive moisture have been reported to be associated with southern pine beetle infestations. Species of southern pines differ in their susceptibility with Longleaf and slash pine being fairly resistant and loblolly and shortleaf pines more susceptible. The underlying factors contributing most to host susceptibility to southern pine beetle throughout the south are reported to be low tree vigor and/or stress.

A number of natural enemies affect beetle populations including insects and mites, birds (especially woodpeckers), and several pathogenic organisms (including fungi, nematodes, bacteria and protozoa). In addition southern pine beetle competes with other insects for the same food supply. Competitors include secondary woodboring beetles as well as other bark beetle species. It is reported that natural enemies may be important in regulating "spot" growth (which are what infested areas are called in the south) particularly in early summer.

While impacts of southern pine beetle in southwestern forest ecosystems have been minimal to date, it would be prudent to consider that this may not always be the case. Southwestern forests have changed considerably over the last century and now are likely much more susceptible to this insect. A number of management strategies have been developed for this insect in the south, however it would be premature to recommend these same strategies here in the southwest where the population dynamics and host relationships are not understood. In this case it would be wise to monitor this population and use it to learn more about the insect where feasible. Some general management recommendations may be applicable where mortality due to this insect may be considered detrimental. Promoting improved growing conditions would be recommended. High risk stands are likely characterized by slow radial growth. Management techniques that promote better growth on remaining stems through manipulation by prescribed fire or possibly silvicultural techniques should reduce susceptibility (in the case of National Forest system lands). Promoting appropriate species composition should reduce susceptibility. Maintaining a diversity of age classes should also promote resistance. In the south, susceptibility to attack increases with age. Large monocultures of susceptible host species are most vulnerable to most bark beetle species.

If you have questions concerning this letter please contact me (520-556-2074) or John Anhold, Arizona Zone Leader (520-556-2073).



Jill L. Wilson

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Entomologist

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E&P: J. Wilson jw: 8/17/00: 1520/556-2074

Concur: J. Anhold 8/18/00

Date found: March 19, 2000

Location: Picket Canyon, Chiricahua National Monument, T16S, R29E, S23 and S26.
The GPS'd location in about the center of the stand is

North 3,544,445

East 654,702

The Chihuahua pine in this canyon are well infested with a bark beetle. There was evidence of several years of past infestations in dead trees and trees which were infested last year. The Apache pine is not affected.

The enclosed beetle was taken from a pitch tube on a pine approximately 10" in diameter. Pupae were seen in the bark of one pine. Beetle activity was seen in trees as small as 5" diameter. From a vantage point near the head of canyon, dead and dying trees were evident throughout the canyon and were also found in a side canyon.

Photos of the general area as well as a gallery in a small tree (about 5" diameter) are enclosed and a map showing the general location of the infested stand. All of main Picket Canyon was not walked.

There were scattered infested trees seen along the main road in the Monument so I suspect the beetle is well established.

The 1993 and 1995 aerial surveys of the Chiricahua Mountains each showed a small pocket of *Ips* southeast of Picket Canyon. These are the only populations that show on the aerial surveys.



CAROL BOYD
Range Program Manager
Coronado National Forest

General area of infestation
T16S, R29E, Gila and Salt River Meridian

